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Exploring the binomial distribution function in the context of Halo Occupation Distribution models

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Lots of resources and human efforts have been dedicated to constrain the nature of dark matter and dark energy with stage IV cosmological surveys. In particular, galaxies will be used as biased tracers of the total matter present in the Universe. In this work, we use a Halo Occupation Distribution (HOD) model to populate dark matter-only simulations with galaxies adapted to eBOSS Emission-Line Galaxies (ELG) clustering data. Then, we establish a connection between numerical simulations and observations using galaxy clustering, in which those galaxies are used as our dark matter biased tracers. The HOD model makes different assumptions for the distribution of galaxies in haloes, in particular for satellite galaxies. One of these assumptions is the probability to find a given number of satellite galaxies in a halo, that is, its Probability Distribution Function (PDF). In general, a Poisson distribution is assumed but some studies show that for some galaxy samples their PDF may be different. In this work we cover the entire possible range of standard deviations adding the binomial distribution to the set of functions previously used. Furthermore, we also want to measure if the HOD parameters depend on the simulations that we use (in particular, taking into account its different assumed cosmologies). For this purpose we implement our improved HOD model to populate the UNIT (1000Mpc/h side + mp, Planck cosmology) and OuterRim (3000Mpc/h side +mp, WMAP cosmology) DM-only simulations with galaxies. Finally, we use eBOSS ELG clustering data in order to constrain the values of the parameters of our HOD models.

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